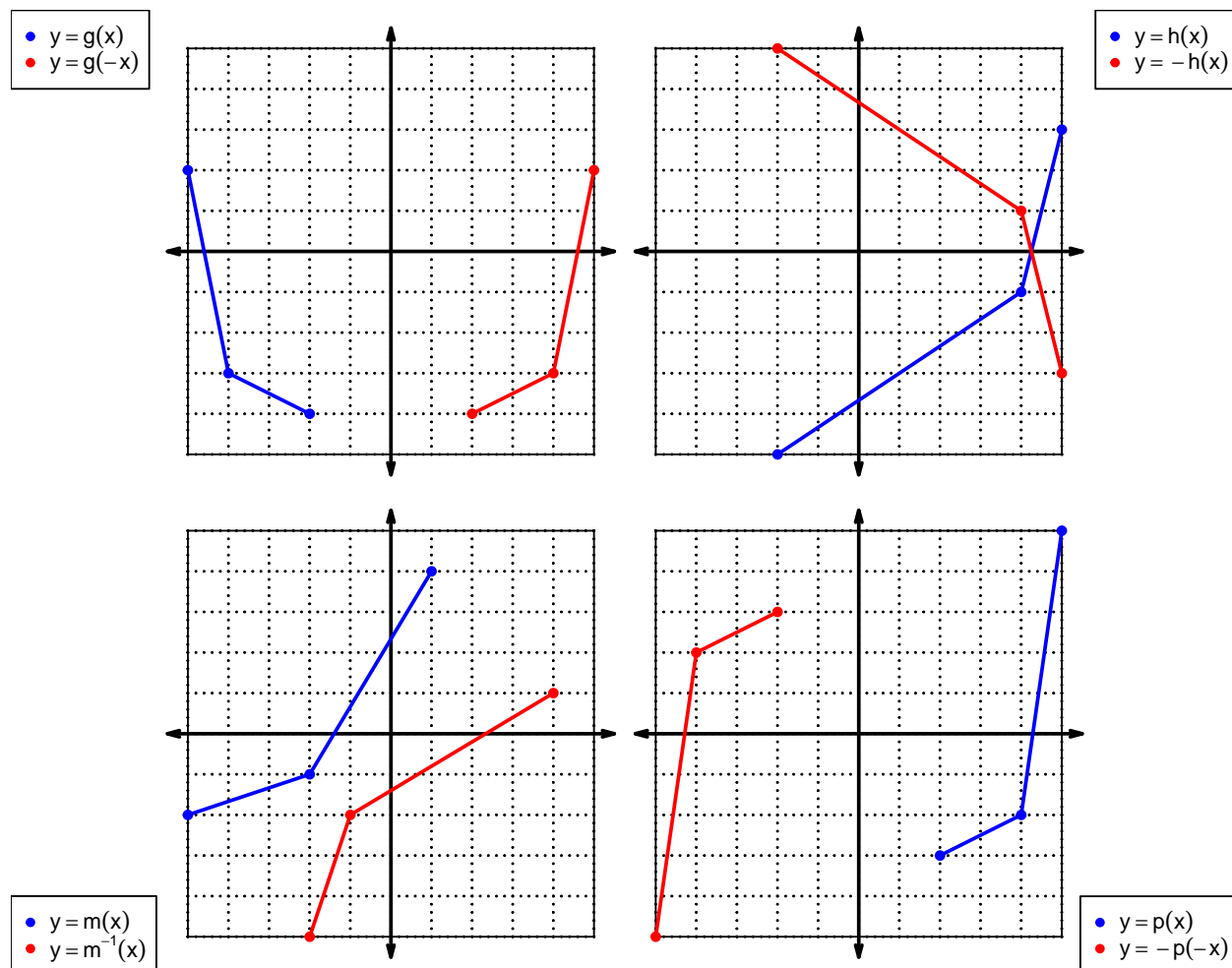# Exam: Function Reflections (Solution version 617)

1. (worth 9 points) Let function f be defined by the polynomial below:

$$f(x) \;=\; -2x^5 - 7x^4 - 5x^3 - 9x^2 - 6x + 8$$

Draw lines that match each function reflection with its polynomial:

Reflections	Polynomials

$-f(-x)$ •   • $2x^5 + 7x^4 + 5x^3 + 9x^2 + 6x - 8$

$f(-x)$ •   • $2x^5 - 7x^4 + 5x^3 - 9x^2 + 6x + 8$

$-f(x)$ •   • $-2x^5 + 7x^4 - 5x^3 + 9x^2 - 6x - 8$

2. (worth 20 points) In each xy plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The x axis is horizontal and the y axis is vertical (as typical), and the scale is equal on both axes.

- $y = g(x)$
- $y = g(-x)$

- $y = h(x)$
- $y = -h(x)$

- $y = m(x)$
- $y = m^{-1}(x)$

- $y = p(x)$
- $y = -p(-x)$

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For all questions on this page, the functions f, g, and h are defined by the table below.

x	$f(x)$	$g(x)$	$h(x)$
1	5	2	3
2	2	3	4
3	8	1	6
4	9	6	7
5	7	4	8
6	1	5	9
7	6	9	1
8	4	7	5
9	3	8	2

3. (worth 3 points) Evaluate $h(8)$.

$$h(8) = 5$$

4. (worth 3 points) Evaluate $g^{-1}(6)$.

$$g^{-1}(6) = 4$$

5. (worth 3 points) Assuming f is an **odd** function, evaluate $f(-9)$.

If function f is odd, then
$$f(-9) = -3$$

6. (worth 3 points) Assuming g is an **even** function, evaluate $g(-2)$.

If function g is even, then
$$g(-2) = 3$$

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7. (worth 15 points) A function, f, is **even** if $f(x) = f(-x)$ for all x in the domain. A function, g, is **odd** if $g(x) = -g(-x)$ for all x in the domain.

Let polynomial p be defined with the following equation:

$$p(x) = x^2 + 1$$

a. Express $p(-x)$ as a polynomial in standard form.

$$p(-x) = (-x)^2 + 1$$
$$p(-x) = x^2 + 1$$

b. Express $-p(-x)$ as a polynomial in standard form.

$$-p(-x) = -\left(x^2 + 1\right)$$
$$-p(-x) = -x^2 - 1$$

c. Is polynomial p even, odd, or neither?

even

d. Explain how you know the answer to part c.

We see that $p(x) = p(-x)$ for all x because $p(x)$ and $p(-x)$ are equivalent polynomials. Thus function p satisfies the criterion for being an even function.

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8. (worth 10 points) I have drawn half of a function. Draw the other half to make it even or odd.

EVEN

ODD
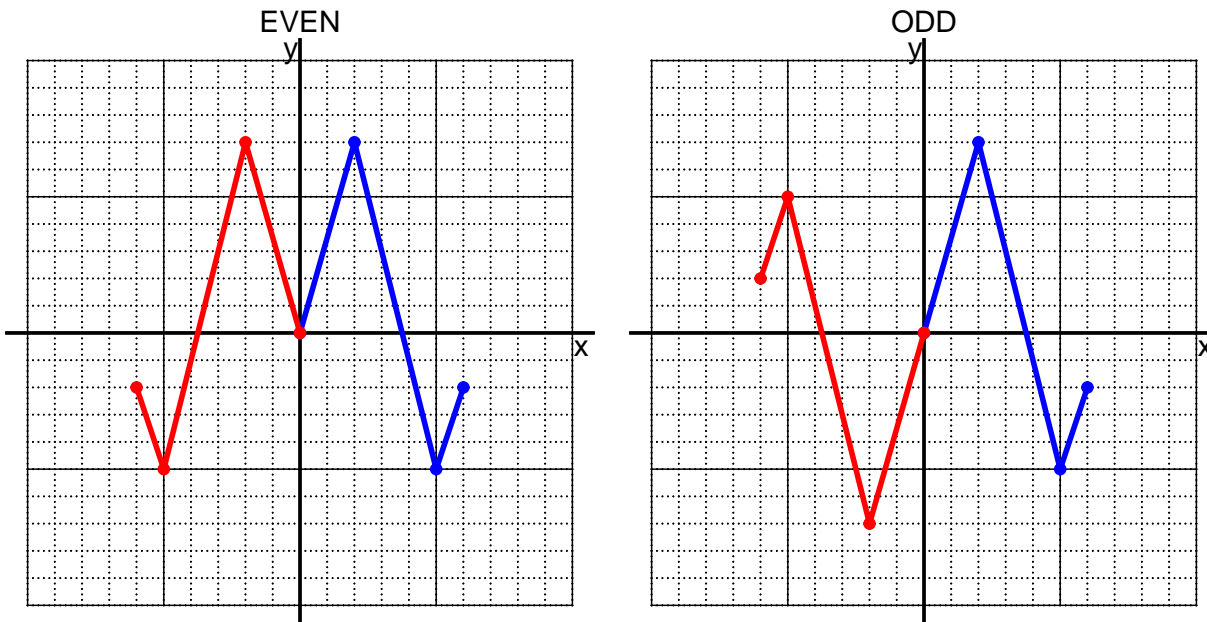
9. (worth 10 points) Let function f be defined with the equation below.

$$f(x) = \frac{x}{3} - 4$$

a. Evaluate $f(30)$.

step 1: divide by 3
step 2: subtract 4

$$f(30) = \frac{(30)}{3} - 4$$
$$f(30) = 6$$

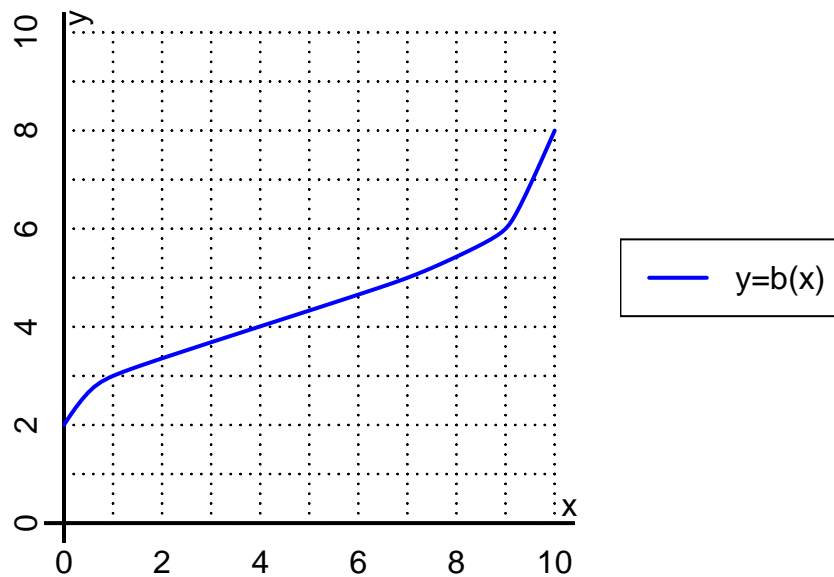b. Evaluate $f^{-1}(22)$.

step 1: add 4
step 2: multiply by 3

$$f^{-1}(x) = 3(x+4)$$
$$f^{-1}(22) = 3((22)+4)$$
$$f^{-1}(22) = 78$$

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10. (worth 6 points) The function b is represented by the curve $y = b(x)$ graphed below.

a. Evaluate $b(9)$.

$$b(9) \;=\; 6$$

b. Evaluate $b^{-1}(3)$.

$$b^{-1}(3) \;=\; 1$$

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11. (worth 18 points) Function f is defined by the table below.

    a. Complete the columns for $-f(x)$ and $f(-x)$ and $-f(-x)$.

x	$f(x)$	$-f(x)$	$f(-x)$	$-f(-x)$
-2	-8	8	8	-8
-1	3	-3	-3	3
0	0	0	0	0
1	-3	3	3	-3
2	8	-8	-8	8

b. Is function f even, odd, or neither?

odd

c. How do you know the answer to part b?

Function f is odd because column $-f(-x)$ matches column $f(x)$ exactly.

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